CUSTOMER NO 24737

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE HONORABLE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of M. KAUS, et al.	)	Examiner: K. FUJITA
	)	Art Unit: 2624
Serial No.: 10/521,254	)	
	)	Confirmation: 9019
Filed: September 14, 2005	)	
For: **AUTOMATED MEASUREMENT OF OBJECTS USING DEFORMABLE MODELS**	)	
Date of Final Office Action: July 16, 2008	)	
Attorney Docket No.: DE020179 / PKRX 2 00115	)	Cleveland, OH 44114 December 16, 2008

BRIEF ON APPEAL

This is an Appeal from the Final Rejection of July 16, 2008 finally rejecting claims 1-9.

An Appeal fee of $540 is submitted herewith.

I. STATEMENT OF REAL PARTY IN INTEREST (41.37(f))

The real party in interest for this appeal and the present application is Koninklijke Philips Electronics, N.V.

II. STATEMENT OF RELATED CASES (41.37(g))

None

III. JURISDICTIONAL STATEMENT (41.37(h))

The Board has jurisdiction under 35 U.S.C. 134(a).

The Examiner mailed a final rejection on July 16, 2008, setting a three-month shortened statutory period for response.

The time for responding to the final rejection expired on October 16, 2008. Rule 134.

A notice of appeal was filed on October 16, 2008. No extension of time was due.

The time for filing an appeal brief is two months after the filing of a notice of appeal. Bd.R. 41.37(c). The time for filing an appeal brief expires on December 16, 2008.

The appeal brief is being filed on the date set forth on the Certificate of Transmission.

IV. TABLE OF CONTENTS (41.37(i))

V. TABLE OF AUTHORITIES (41.37(j))

None

VI. STATUS OF AMENDMENTS (41.37(l))

An Amendment and/or Response Under 37 CFR § 1.116 was filed on September 16, 2008. This Amendment has been entered.

VII. GROUNDS OF REJECTION TO BE REVIEWED (41.37(m))

The grounds of rejection are not clearly set forth in the Final Rejection. The Examiner states that claims 1-3, 8, and 9 stand rejected under 35 U.S.C. §102(b) as being anticipated by Chaney, et al. (US 5,926,568). The Office Action Summary indicates that claims 1-9 are rejected. On pages 6 and 7 of the Office Action, the Examiner asserts that Chaney discloses the subject matter of claims 4-7. However, no statutory basis is provided for the rejection of claims 4-7.

The rejections to be reviewed include:

1. Whether claims 1-3, and 9 are anticipated in the sense of 35 U.S.C. §102 over Chaney; and,
2. Whether claims 4-7 are properly rejected based on Chaney.

VIII. **STATEMENT OF FACTS (41.37(n))**

1. (Claim 1, lines 1-2). Claim 1 is directed to a method for determining geometrical properties of a structure in a displayed image.

2. Typical geometric properties to a femur, for example, include a direction location of the axis of the femur neck, a location and orientation of the femur shaft, and the like (present application, page 12, lines 18-21).

3. Column 22, line 51 of Chaney, referenced by the Examiner, relates to computer program instructions for a processor and does not address a method for determining geometric properties. (Chaney, col. 22, line 57).

4. The applications which Chaney suggests include registration of intra-operative treatment guidance, measurement of shape change over time, segmentation, and measurement of shape change (Chaney, Fig. 6, 185, 186, 187, 196, 197; col. 23, lines 25-44).

5. Claim 1 further calls for applying additional geometrical information to the adapted deformable surface model of the object. (Claim 1, lines 4-5).

6. In the example of the femur, applying additional geometrical might include labeling mesh triangles which correspond to a sub-part of the femur, such as the femur head, a sphere for determining the

center of the femur head, a straight line for detecting the axis of the femur shaft, and the like (present application, page 7, lines 11-12 and 19-22).

7. The Examiner asserts that limitation (b) of claim 1 is shown by item 177 in Figure 6 of Chaney (Final Rejection, page 5, paragraph 2).

8. Chaney is interested in a method for automatic recognition of objects in images which is tolerant of shape variability and image disturbances and on more economic ways to register or segment radiographic planning images (Chaney, col. 3, lines 32-45).

9. Chaney supplies a plurality of training images 176, i.e., images from a plurality of different subjects in which the anatomical object of interest has been properly segmented (Chaney, col. 23, lines 37-44).

10. An example of extracting geometrical properties in an example of a vertebra can include determining an orientation of an end plane of the vertebra, coordinates on the end plane, and a normal thereto (present application, page 9, line 25, and page 11, lines 10-16).

11. The Examiner asserts that step (c) of claim 1 is met by element 197 of Figure 6 (Final Rejection, page 5, paragraph 3).

12. Block 197 of Figure 6 of Chaney is directed to measuring a shape variation or a shape change (Chaney, col 23, lines 42-44).

13. In the example of the femur, the geometrical primitive might include a sphere or a straight line (present application, page 7, lines 21-22).

14. Claim 2 calls for fitting a geometrical primitive to the surface elements of an identified subpart of the object in the deformable surface model. (Claim 2, lines 6-9).

15. The Examiner asserts that fitting a geometrical to surface elements is met by col. 21, line 34 of Chaney (Final Rejection, page 5, sixth paragraph).

16. Col. 21, lines 24-38 of Chaney relate to translating, rotating, and scaling four subfigures, as may be necessary, to fit the four sub-images accurately together. (Chaney, Col. 21, lines 24-38).

17. A sphere can be used as a geometrical primitive to extract the centroid of the head of a femur and the geometrical primitive of a straight line can be used to extract an axis of the femur shaft. (present application, p. 7, l. 7-9, 20-23).

18. Claim 3 calls for the geometrical properties of the object to be extracted on the basis of a geometrical primitive. (Claim 3, l. 1-3).

19. The Examiner asserts that this extracting geometrical properties based on a geometrical is met at col. 21, starting at line 20 of Chaney (Final Rejection, p. 5, last paragraph).

20. Col. 21, starting at line 20 relates to translating, rotating, or scaling, as may be appropriate, to fit a plurality of sub-figures together accurately such that boundary sites are guided to their approximate locations in an initial stage and stability is provided during a local optimization stage (Chaney, col. 21, lines 47-50).

21. Claim 4 calls for identifying surface elements of a particular subpart of the object by means of labels assigned to the surface elements. (Claim 4, lines 2-4)

22. When using a triangular to model a femur, the triangles belonging to the same subpart, e.g., the femur head, are given the same label (present application, page 7, lines 7-13).

23. The Examiner asserts that Chaney, at col. 13, line 47 discloses labeling surface elements belonging to a particular subpart (Final Rejection, page 6, first paragraph).

24. Col. 13, line 47 of Chaney relates to labeling links, such as a media link, medial boundary link, and Figure-Figure links (Chaney, col. 13, l. 47).

25. In Figure 3 of Chaney, the links in question including the medial loci 15 that are joined to adjacent medial loci by medial-to-medial links 15′, etc. (Chaney, Fig. 3, col. 8, l. 57+)

26. When adapting a surface model to a femur, for example, the additional geometrical information may include a sphere around

the femur head for determining its center or a straight line for determining an axis of a femur shaft (present application, page 7, lines 7-9 and 20-24).

27. Claim 5 calls for integrating additional geometrical information into a deformable surface model. (Claim 5, lines 7-8).

28. The Examiner asserts that the claim 5 limitation of integrating additional geometric information into a deformable surface model is met by Figure 6, reference 177 of Chaney (Final Rejection, page 6, paragraph 4).

29. By contrast, the block 177 of Figure 6 of Chaney is the producing of an object model with shape variability (Chaney, col. 23, lines 36-44).

30. Claim 6 calls for selecting surface elements which belong to a subpart of the object and labeling such surface elements. (Claim 6, lines 4-8).

31. The Examiner asserts that col. 21, line 22 discloses selecting surface elements and col. 13, line 47 discloses labeling them (Final Rejection, page 6, last two paragraphs).

32. Col. 21, line 22 discusses defining a set of inter-figural links which connect neighboring boundary sites of the subfigures and the parent figure, not the selecting of surface elements of a deformable

surface model which belongs to a subpart of an object. (Chaney, col. 21, l. 22).

33. Col. 13, line 47 refers to Figure 3 of Chaney, in which the various types of links are "labeled" in the legend to Figure 3 (Chaney, Figure 3, col. 13, l. 47).

34. The labeling referenced in col. 13, line 47 merely references the legend of Figure 3 and does not refer to any labeling operation performed by Chaney (Chaney, col. 13, line 47; Fig. 3 legend).

35. Claim 7 calls for selecting a geometrical primitive in accordance with a form of a subpart of the object. (Claim 7, lines 4-5).

36. The Examiner asserts that col. 21, line 20 of Chaney discloses selecting a geometrical primitive (Final Rejection, page 7, second paragraph).

37. Claim 7 further calls for determining a rule which maps a geometrical primitive onto the surface elements of the plurality of surface elements of the deformable surface model. (Claim 7, lines 6-8).

38. The Examiner asserts that determining a rule which maps a geometrical primitive is met by col. 21, line 34 of Chaney (Final Rejection, page 7, paragraph 3).

39. Col. 21, line 34 of Chaney relates to translating, rotating, and scaling subfigures, as may be necessary, to fit them together accurately (Chaney, col. 21, l. 34).

IX. ARGUMENT (41.37(o))

A. Claims 1-4, 8, and 9 Are Not Anticipated By Chaney

This argument is substantially revised and expanded from the Amendment After Final. Claim 1 is directed to a method for determining geometrical properties of a structure in a displayed image. Typical geometric properties to a femur, for example, include a direction location of the axis of the femur neck, a location and orientation of the femur shaft, and the like (present application, page 12, lines 18-21). Chaney does not disclose or fairly suggest determining such geometric properties. The Examiner directs the applicant's attention to column 22, line 51. However, column 22, line 51 of Chaney relates to computer program instructions for a processor and does not address a method for determining geometric properties. Indeed, the applications which Chaney suggests include registration of intra-operative treatment guidance, measurement of shape change over time, segmentation, and measurement of shape change (Chaney, Fig. 6, 185, 186, 187, 196, 197; col. 23, lines 25-44).

Claim 1 further calls for applying additional geometrical information to the adapted deformable surface model of the object. In the example of the femur, this might include labeling mesh triangles which correspond to a sub-part of the femur, such as the femur head, a sphere

for determining the center of the femur head, a straight line for detecting the axis of the femur shaft, and the like (present application, page 7, lines 11-12 and 19-22).

The Examiner asserts that limitation (b) of claim 1 is shown by item 177 in Figure 6 of Chaney (Final Rejection, page 5, paragraph 2). By contrast, step 177 of Chaney relates to generating an object model with shape variabilities. More specifically, Chaney is interested in a method for automatic recognition of objects in images which is tolerant of shape variability and image disturbances and on more economic ways to register or segment radiographic planning images (Chaney, col. 3, lines 32-45). One of the ways which Chaney achieves this object is by developing an object model with shape variabilities in step 175 of Figure 6. More specifically, Chaney supplies a plurality of training images 176, i.e., images from a plurality of different subjects in which the anatomical object of interest has been properly segmented (Chaney, col. 23, lines 37-44). From this plurality of training images, Chaney creates an object model which is sufficiently variable that it can identify the anatomical structure in question over the full range of additional training images and can segment the anatomical structure accurately. For example, when identifying or segmenting the region of the brain shown in Figure 5 of Chaney, the object model with shape variabilities has "learned" from the additional training images how much the shape and

size can vary. The model knows not to try to include, for example, a portion of the head down near the jaw into the segmented brain region of Figure 5.

Thus, reference number 177 of Chaney referenced by the Examiner relates to an object model with shape variabilities and does not disclose applying additional geometric information to a deformable surface model of the object adapted to the object.

Claim 1 further calls for extracting the geometrical properties of the structure of the object from the adapted deformable surface model to which the additional geometrical information has been applied. An example of extracting geometrical properties in an example of a vertebra, for example, can include determining an orientation of an end plane of the vertebra, coordinates on the end plane, and a normal thereto (present application, page 9, line 25, and page 11, lines 10-16.

The Examiner asserts that this step (c) of claim 1 is met by element 197 of Figure 6 (Final Rejection, page 5, paragraph 3). Block 197 of Figure 6 of Chaney is directed to measuring a shape variation or a shape change (Chaney, col 23, lines 42-44). Chaney does not explain the function of block 197 further, leaving one to guess whether this might relate to segmenting a tumor, for example, in images of the same patient taken currently and earlier in treatment for the tumor, and determining how much the tumor has shrunk or, maybe, block 197 is intended to

connote that the anatomical structure of the patient is compared to a standard to determine the deviation from "normal". However, measuring a shape variation or change is not extracting geometrical properties of a structure.

Thus, Chaney describes measuring shape variation or change; whereas, claim 1 calls for extracting geometrical properties of a structure of an object.

For the reasons set forth above, it is submitted that claim 1 and claims 2-4 dependent therefrom are not anticipated by Chaney.

Subparagraphs (a), (b), and (c) of claims 8 and 9 of the present application are substantially the same as paragraphs (a), (b), and (c) of claim 1. Accordingly, claims 1, 8 and 9 stand or fall together.

B. **Claim 2 is Not Anticipated by Chaney**

This argument is new.

Claim 2 calls for fitting a geometrical primitive to the surface elements of an identified subpart of the object in the deformable surface model. In the example of the femur, the geometrical primitive might include a sphere or a straight line (present application, page 7, lines7-9, 21-22).

The Examiner asserts that this limitation is met by col. 21, line 34 of Chaney (Final Rejection, page 5, sixth paragraph). Col. 31, line 35 of Chaney does not fit a geometrical primitive to surface elements of a

deformable surface model. Rather, col. 21, lines 24-38 of Chaney relate to translating, rotating, and scaling four subfigures, as may be necessary, to fit the four sub-images accurately together.

Because claim 2 calls for fitting a geometrical primitive to surface elements of a deformable surface model; whereas, col. 21, line 35 of Chaney relates to translating, rotating, or scaling a plurality of sub-images or sub-figures to bring them into alignment, it is submitted that claim 2 is not anticipated by Chaney.

C. **Claim 3 is Not Anticipated by Chaney**

This argument is new.

Claim 3 calls for the geometrical properties of the object to be extracted on the basis of a geometrical primitive. As previously discussed, using a sphere as a geometrical primitive can be used to extract the centroid of the head of a femur and the geometrical primitive of a straight line can be used to extract an axis of the femur shaft. The Examiner asserts that this limitation is met at col. 21, starting at line 20 of Chaney. This section of Chaney does not discuss or disclose either a geometrical primitive nor extracting geometrical properties on the basis of a geometrical primitive. Rather, this section relates to translating, rotating, or scaling, as may be appropriate, to fit a plurality of sub-figures together accurately such that boundary sites are guided to their

approximate locations in an initial stage and stability is provided during a local optimization stage (Chaney, col. 21, lines 47-50).

Accordingly, it is submitted that claim 3 is not anticipated by Chaney.

D. Claim 4 is Not Anticipated by Chaney

This argument is new.

Claim 4 calls for identifying surface elements of a particular subpart of the object by means of labels assigned to the surface elements. Surface elements are elements, such as triangles, of a deformable mesh (present application, page 4, lines 15-28). When using a triangular to model a femur, the triangles belonging to the same subpart, e.g., the femur head, are given the same label (present application, page 7, lines 7-13.

The Examiner asserts that Chaney, at col. 13, line 47 discloses labeling surface elements belonging to a particular subpart (Final Rejection, page 6, first paragraph). Col. 13, line 47 of Chaney, by distinction, relates to labeling links, such as a medial-medial link, medial boundary links, and figure-figure links. Perhaps this could be better understood if this section of Chaney had used the proper reference numerals, or at least the reference numerals which correspond to the reference numerals in Figure 3. However, by looking to col. 8, starting at line 57, one can see that in Figure 3 the links in question including the

medial loci 15 that are joined to adjacent medial loci by medial-to-medial links 15′, etc. Each of the subfigures has its own links. These links are lines which connect loci; not triangular (or other polygonal) surface elements. Surface elements which might be defined by three adjacent loci of Chaney are not labeled.

Accordingly, it is submitted that claim 4 is not anticipated by Chaney.

E. **Claim 5 is Not Anticipated by or Otherwise Unpatentably over Chaney**

This argument is revised and expanded from the argument presented in the Amendment After Final.

Claim 5 calls for integrating additional geometrical information into a deformable surface model. When adapting a surface model to a femur, for example, the additional geometrical information may include a sphere around the femur head for determining its center or a straight line for determining an axis of a femur shaft (present application, page 7, lines 7-9 and 20-24).

The Examiner asserts that the claim 5 limitation of integrating additional geometric information into a deformable surface model is met by Figure 6, reference number 177 of Chaney (Final Rejection, page 6, paragraph 4). By contrast, the block 177 of Figure 6 of Chaney, as discussed at col. 23, lines 36-44, is the producing of an object model with

shape variability. Specifically, by learning the various different shapes that a given anatomical structure can have by studying a plurality of training images 176, i.e., images of a variety of patients with the given anatomical structure properly segmented, Chaney creates a model which can vary within the parameters of the training images. Chaney creates the variable deformable surface model from training images and makes no suggestion of integrating additional geometrical information.

Because Chaney does not disclose integrating additional geometrical information into a deformable surface model, it is submitted that claim 5 and claims 6 and 7 dependent therefrom are not anticipated by Chaney.

F. Claim 6 is Not Anticipated by or Otherwise Unpatentable Over Chaney

This argument is new.

Claim 6 calls for selecting surface elements which belong to a subpart of the object and labeling such surface elements. The Examiner asserts that col. 21, line 22 of Chaney discloses selecting surface elements and col. 13, line 47 of Chaney discloses labeling them. By contrast, col. 21, line 22 of Chaney discusses defining a set of inter-figural links which connect neighboring boundary sites of the subfigures and the parent figure, not the selecting of surface elements of a deformable surface model which belongs to a subpart of an object. Col. 13, line 47

refers to Figure 3 of Chaney in which the various types of links are "labeled" in the legend to Figure 3. The labeling referenced in col. 13, line 47 merely references the legend of Figure 3 and does not refer to any labeling operation performed during Chaney process (Chaney, col. 13, line 47; Fig. 3 legend).

Because boundaries or links are not surface elements in the sense of the triangular (or other polymeric shape) mesh of a deformable surface model and because the "labeling" referenced in col. 13, line 47 does not reference any operation performed by Chaney, it is submitted that claim 6 is not anticipated by Chaney.

G. **Claim 7 is Not Anticipated by Chaney**

Claim 7 calls for selecting a geometrical primitive in accordance with a form of a subpart of the object. For example, a sphere might be selected in accordance with a femur head. The Examiner asserts that col. 21, line 20 of Chaney discloses selecting a geometrical primitive (Final Rejection, page 7, second paragraph). By contrast, the links connect neighboring boundary sites and are not geometrical primitives.

Claim 7 further calls for determining a rule which maps a geometrical primitive onto the surface elements of the plurality of surface elements of the deformable surface model. The Examiner asserts that this limitation is met by col. 21, line 34 of Chaney (Final Rejection, page 7, col. 3). By contrast, col. 21, line 34 of Chaney relates to translating,

rotating, and scaling subfigures, as may be necessary, to fit them together accurately. This section does not relate to or describe mapping a geometric primitive onto a surface element, much less determining a rule for doing so.

Accordingly, it is submitted that claim 7 is not anticipated by Chaney.

H. CONCLUSION

For all of the reasons discussed above, it is respectfully submitted that claims 1-9, all claims, are not anticipated by and distinguish patentably over Chaney. For all of the above reasons, a reversal of the rejections of all claims is requested.

Respectfully submitted,

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APPENDIX

X. CLAIMS SECTION (41.37(p))

1. (Rejected) Method for determining geometrical properties of a structure of an object displayed in an image, comprising the steps of:

(a) adapting a deformable surface model to the object;

(b) applying additional geometrical information to the adapted deformable surface model of the object; and

(c) extracting the geometrical properties of the structure of the object from the adapted deformable surface model to which the additional geometrical information has been applied.

2. (Rejected) Method according to claim 1, wherein step (b) of applying additional geometrical information to the adapted deformable surface model of the object further comprises the steps of:

identifying surface elements of the deformable surface model relating to a particular sub-part of the object; and

fitting a geometrical primitive to the surface elements relating to the particular sub-part of the object in the deformable surface model, the geometrical primitive having a form corresponding to a form of the particular sub-part.

3. (Rejected) Method according to claim 2, wherein the geometrical properties of the object are extracted on the basis of the geometrical primitive.

4. (Rejected) Method according to claim 2, wherein the surface elements of the particular sub-part of the object are identified by means of labels assigned to the surface elements belonging to the particular sub-part.

5. (Rejected) Method for determining an extended deformable surface model for adaptation to an object, comprising the steps of:

(a) determining a deformable surface model of the object, wherein the deformable surface model describes a surface of the object; and

(b) integrating additional geometrical information into the deformable surface model.

6. (Rejected) Method according to claim 5, wherein step (b) of integrating additional geometrical information into the deformable surface model further comprises the steps of:

selecting surface elements of a plurality of surface elements of the deformable surface model which belong to a sub-part of the object;

labeling the surface elements of the plurality of surface elements of the deformable surface model such that surface elements which belong to the same sub-part have the same label.

7. (Rejected) Method according to claim 6, wherein step (b) of integrating additional geometrical information into the deformable surface model further comprises the steps of:

selecting a geometrical primitive in accordance with a form of the sub-part; and

determining a rule which maps the geometrical primitive onto the surface elements of the plurality of surface elements of the deformable surface model.

8. (Rejected) Image processing device, comprising:

a memory for storing a deformable model and an image depicting an object; and

an image processor for determining geometrical properties of the object, which processor performs the following operation:

(a) adapting a deformable surface model to the object;

(b) applying additional geometrical information to the adapted deformable surface model of the object; and

(c) extracting the geometrical properties of the structure of the object from the adapted deformable surface model to which the additional geometrical information has been applied.

9. (Rejected) A computer-readable medium having processor-executable instructions thereon for an image processing device in accordance with claim 8 which, when executed by a processor, direct the processor to determine geometrical properties of an object, comprising the following steps:

(a) adapting a deformable surface model to the object;

(b) applying additional geometrical information to the adapted deformable surface model of the object; and

(c) extracting the geometrical properties of the structure of the object from the adapted deformable surface model to which the additional geometrical information has been applied.

APPENDIX (Continued)

XI. CLAIM SUPPORT AND DRAWING ANALYSIS SECTION (41.37(r))

1. Method for determining geometrical properties of a structure of an object displayed in an image **{p. 2, l. 14-16}**, comprising the steps of:

(a) adapting a deformable surface model to the object **{51; p. 2, l. 20; 102, 103; p. 9, l. 6-14}**;

(b) applying additional geometrical information to the adapted deformable surface model of the object **{52; p. 2, l. 20-22; p. 7, l. 4 – p. 8, l. 8; p. 8, l. 10-16}**; and

(c) extracting the geometrical properties of the structure of the object from the adapted deformable surface model to which the additional geometrical information has been applied **{104, 105; p. 2, l. 22-24; p. 9, l. 16-26; p. 10, l. 10 – p. 11, l. 16; p. 11, l. 18-28}**.

2. Method according to claim 1, wherein step (b) of applying additional geometrical information to the adapted deformable surface model **{p. 3, l. 5-10}** of the object further comprises the steps of:

identifying surface elements of the deformable surface model relating to a particular sub-part of the object **{53, 54; p. 7, l. 6-17}**; and

fitting a geometrical primitive to the surface elements relating to the particular sub-part of the object in the deformable surface model, the geometrical primitive having a form corresponding to a form of the particular sub-part **{55; 57; p. 7, l. 19-23; p. 8, l. 5-8}**.

3. Method according to claim 2, wherein the geometrical properties of the object are extracted on the basis of the geometrical primitive **{55; l. 25-29; 102-105; p. 8, l. 18 – p. 10, l. 4; 104, 105; p. 9, l. 16-26; p. 10, l. 10 – p. 11, l. 28}**.

4. Method according to claim 2, wherein the surface elements of the particular sub-part of the object are identified by means of labels assigned to the surface elements belonging to the particular sub-part **{p. 2, l. 19-21; 54; p. 7, l. 9-17; 104; p. 9, l. 19-26; p. 10, l. 6-26}**.

5. Method for determining an extended deformable surface model for adaptation to an object **{p. 2, l. 23-28}**, comprising the steps of:

(a) determining a deformable surface model of the object, wherein the deformable surface model describes a surface of the object **{51, p. 6, l. 18-24}**; and

(b) integrating additional geometrical information into the deformable surface model **{52; p. 2, l. 20-22; p. 7, l. 4 – p. 8, l. 8; p. 8, l. 10-16}**.

6. Method according to claim 5, wherein step (b) of integrating additional geometrical information into the deformable surface model **{p. 4, l. 1-5}** further comprises the steps of:

selecting surface elements of a plurality of surface elements of the deformable surface model which belong to a sub-part of the object **{53; p. 7, l. 4-9}**;

labeling the surface elements of the plurality of surface elements of the deformable surface model such that surface elements which belong to the same sub-part have the same label **{54; p. 7, l. 9-17}**.

7. Method according to claim 6, wherein step (b) of integrating additional geometrical information into the deformable surface model **{p. 4, l. 79}** further comprises the steps of:

selecting a geometrical primitive in accordance with a form of the sub-part; and

determining a rule which maps the geometrical primitive onto the surface elements of the plurality of surface elements of the deformable surface model.

8. Image processing device **{p. 4, l. 11-12; Fig. 1, p. 6, l. 5-15}**, comprising:

a memory **{2}** for storing a deformable model and an image depicting an object **{p. 6, l. 8-9}**; and

an image processor **{1}** for determining geometrical properties of the object, which processor performs the following operation **{p. 4, l. 9-15}**:

(a) adapting a deformable surface model to the object **{51; p. 2, l. 20; 102, 103; p. 9, l. 6-14}**;

(b) applying additional geometrical information to the adapted deformable surface model of the object **{52; p. 2, l. 20-22; p. 7, l. 4 – p. 8, l. 8; p. 8, l. 10-16}**; and

(c) extracting the geometrical properties of the structure of the object from the adapted deformable surface model to which the additional geometrical information has been applied **{104, 105; p. 2, l. 22-24; p. 9, l. 16-26; p. 10, l. 10 – p. 11, l. 16; p. 11, l. 18-28}**.

9. A computer-readable medium having processor-executable instructions thereon for an image processing device in accordance with claim 8 which, when executed by a processor, direct the processor to determine geometrical properties of an object **{p. 4, l. 11-13}**, comprising the following steps:

(a) adapting a deformable surface model to the object **{51; p. 2, l. 20; 102, 103; p. 9, l. 6-14}**;

(b) applying additional geometrical information to the adapted deformable surface model of the object **{52; p. 2, l. 20-22; p. 7, l. 4 – p. 8, l. 8; p. 8, l. 10-16}**; and

(c) extracting the geometrical properties of the structure of the object from the adapted deformable surface model to which the additional geometrical information has been applied **{104, 105; p. 2, l. 22-24; p. 9, l. 16-26; p. 10, l. 10 – p. 11, l. 16; p. 11, l. 18-28}**.

APPENDIX (Continued)

XII. MEANS OR STEP PLUS FUNCTION ANALYSIS SECTION (41.37(s))

Not applicable.

APPENDIX (Continued)

XIII. **EVIDENCE SECTION (41.37(t))**

None.

APPENDIX (Continued)

XIV. **RELATED CASES SECTION (41.37(u))**

None.